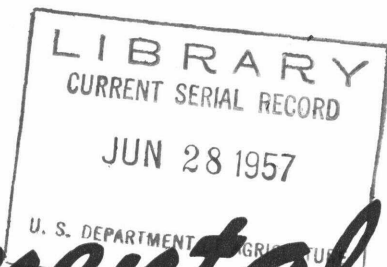


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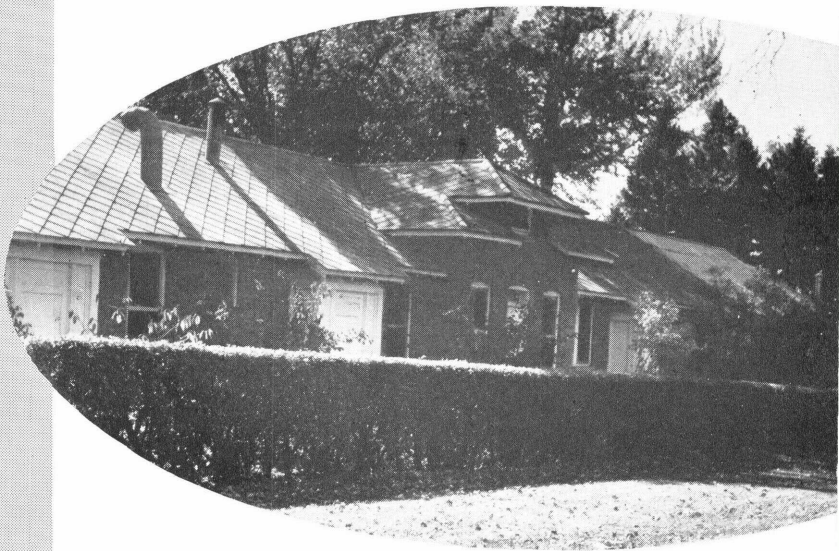
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Ornamental Hedges

FOR THE
NORTHERN
GREAT PLAINS



Farmers' Bulletin No. 2105

UNITED STATES DEPARTMENT OF AGRICULTURE

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Ornamental Hedges



FOR THE NORTHERN GREAT PLAINS

By W. P. BAIRD, *horticulturist, Crops Research Division, Agricultural Research Service*

The use of hedges in connection with the landscaping of home or public grounds, for screening purposes, and for protection from wind is of general interest to both rural and urban dwellers in the northern Great Plains.

Hedges may be high or low; trimmed or untrimmed; deciduous or evergreen; planted in straight rows, curved rows, or angled rows. Some have attractive flowers and fruits; others have attractively colored fall foliage or winter bark. Climbing vines are sometimes trained on fences or trellises as substitutes for hedges.

Many hedges planted in the northern Great Plains have failed to produce the results for which they were intended. A half-dead scraggly hedge is worse than none at all. Aside from climatic factors, the main reasons for such failures are the planting of varieties not adapted to the area and improper care and trimming of hedges that thrive. In order to determine the relative merits of different species for hedge purposes and to obtain information on growing hedges in the area, hedge tests have been in progress at different experiment stations for many years (fig. 1).

Hedge tests were started at the Northern Great Plains Field Station, near Mandan, N. Dak., in 1915. The different species were planted in rows 10 feet apart. Clean cultivation has been practiced,

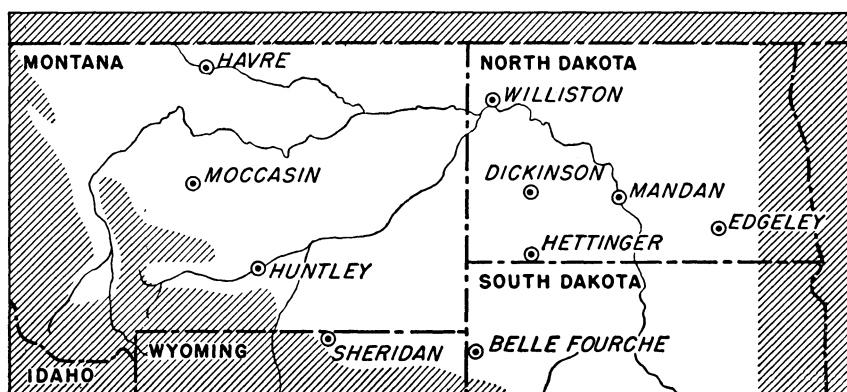


FIGURE 1.—Map of the northern Great Plains, showing the location of State and Federal experiment stations.

but no fertilizer or irrigation water has been applied. Many of the hedges of the original planting are still alive and in good condition.

CLIMATE

The climate of the northern Great Plains may be classed as semi-arid, but it is variable from year to year. The average annual precipitation at Mandan, N. Dak., for the period 1915-54 was 15.94 inches, with extremes of 24.06 inches in 1915 and only 6.43 inches in 1936. Other climatic characteristics are long cold winters, short warm summers, severe drying winds, and a relatively high rate of evaporation.

USES OF HEDGES

Hedges have many uses, and the type of hedge to develop as well as the species to choose depends largely on the purpose for which the hedge is intended. A common use of all hedges is to improve the attractiveness of areas around homes. Well-kept thrifty hedges are things of beauty in themselves, especially when they are properly combined with other landscape plantings.

Hedges are used as living fences to mark boundaries between properties and divisions between front and backyards, to enclose backyards, and as background plantings for low-growing shrubs or flowerbeds.

Low, trimmed hedges are used as foreground plantings for shrub groups, as border plantings for flowerbeds, and to enclose front lawns and prevent people from cutting across corners or otherwise walking on the grass.

Tall hedges, either trimmed or untrimmed, are used as screens to cut off the view of unsightly buildings or areas; to shelter from wind small areas such as flowerbeds, gardens, and clothes-drying yards; to aid in controlling drifting snow; and to keep the backyard private from the view of the public or neighbors.

Some hedges are thorny and thus serve as good barriers, and some produce fruits which are useful either for bird food or for human consumption.

Hedges are also used widely in landscaping public parks, school grounds, and the grounds of public buildings and institutions.

PLANTING STOCK

Although it is possible to raise your own planting stock for hedges by planting the seed in nursery rows in some suitable place such as near your garden, you probably will find it desirable to purchase your planting stock from a reliable nursery. This is especially true of evergreen species, which require special care. They are extremely difficult for the amateur to grow.

Be sure the plants are thrifty and free from insects and diseases, as the success of your hedge depends on getting the plants off to a good start with no gaps because some plants failed to grow. If any gaps do occur, replant as soon as possible as it is difficult to establish new plants in older hedges.

Purchase plants that are as much alike as possible in age, size, form, and root development, because uniform plants greatly enhance the appearance of a hedge.

Young trees or shrubs are best for starting hedges. They are cheaper than older plants, and usually produce a better stand. Also, you will find it easier to train young plants to the desired shape and to obtain a dense, bushy growth from the bottom up.

One-year-old seedlings are best for most deciduous species. However, if the species grows relatively slowly when young, 2-year-old plants are better.

Stock that has been transplanted once in the nursery is best for coniferous hedges. These transplants will be 3 to 4 years old. Better stands will be obtained if the young conifers were grown in individual cans or other containers in the nursery. Although older conifers (5 to 7 years old) are expensive, they are sometimes planted for quick results. To insure a perfect stand, older conifers should be balled and burlapped for moving.

Two-year-old transplanted stock is best for vegetatively propagated species, such as roses, spireas, and lilacs.

If you decide to plant older stock than recommended here, in order to obtain quick results, select only plants that have been properly trained for hedges in the nursery. These will make a hedge quickly, but they are expensive.

Unless the nursery raised them especially for hedges, older plants usually lack a dense growth of side branches near the bottom, and they are impossible to train into desirable hedges unless you cut them back close to the ground so they can develop new tops with low side branches. It is especially important for coniferous seedlings to have a dense growth of side branches near the bottom of the trees, as they do not stand severe cutting back close to the ground.

HANDLING AND PLANTING THE STOCK

The most desirable time to plant hedges in the northern Great Plains is in early spring, soon after the frost is out of the ground and before the seedlings start new growth. Fall planting is not recommended.

Take care to keep the roots of your planting stock from drying out at any time. If you do not plant the hedge within a short time after you obtain the plants from the nursery, heel in the plants until you can plant them. To do this, dig a trench with one sloping side deep enough to admit the roots. Separate the plants in the bundle so you can work fine, moist soil around all the roots. Then lay the plants down at right angles to the trench, with the roots in the trench and the tops near the ground on the sloping side. Pack the soil around the roots, and water the ground well as a further precaution against drying out; then throw more soil on until the roots are covered to a depth of several inches.

If you are likely to keep the plants heeled in for a considerable time, especially if you intend to keep them over winter, partly cover the tops with moist soil. When planting, carry the roots in a pail or tub partly filled with water, or wrap them in wet burlap to keep them

moist. Exposure of the roots to hot sun and wind for even a few minutes may cause serious injury and result in a poor stand.

Good soil is essential if you want to be sure of a good stand and desirable growth over a long period of time. Very shallow soils, soils underlaid with coarse gravel, rocky land, and alkaline soils are undesirable for hedges.

If you want to plant a hedge in some particular place where the soil is not suitable, it will help to dig a ditch about 2 feet deep and 2 feet wide and fill it with good topsoil. Partly fill the ditch before you start to plant the hedge, and fill it up as you plant.

Very heavy or light soils will be benefited if you work garden compost or well-rotted manure into the soil before you plant the hedge. Although manure greatly benefits such soils, heavy applications may sometimes burn the roots of newly set-out plants.

The spacing of plants in the row depends on the kind of stock and the purpose of the hedge. Plants for small formal hedges should be spaced 6 to 8 inches apart in the row. Plants for medium-sized hedges should be spaced about 12 inches apart. Vigorous-growing plants for tall, trimmed hedges should be spaced 18 to 30 inches apart. Conifers for tall screens that require little trimming should be spaced about 6 feet apart.

Plants for informal or untrimmed hedges should be spaced farther apart than the same species for trimmed hedges.

Slow-growing vines that are to serve as substitutes for hedges are usually spaced 4 feet apart, and faster-growing vines up to 8 feet apart.

As the hedge grows taller, it also grows wider. At planting time, make allowance for this spreading. Do not plant too close to sidewalks, footpaths, roads, or buildings. The amount of spread depends on the species and on the kind and amount of trimming. Small hedges may be kept to a foot or less in width, but most trimmed hedges reach a width of from 3 to 4 feet. Vigorous-growing species for tall, trimmed hedges may reach a width of 5 or 6 feet. However, both medium-sized and tall hedges may be trimmed to narrower widths. Untrimmed hedges need more room than formal hedges of the same species.

You can dig individual holes for the plants if you place them 3 feet or more apart, but for closer spacings it is better to dig or plow a ditch deep enough and wide enough to admit the roots without crowding. Set the plants a little deeper than they stood in the nursery and pack fine soil firmly around the roots. Be sure the row is straight except where you intend it to be curved. It is advisable to water the plants well at planting time and to water them again in a few weeks if rains do not occur.

Most hedges are planted in single rows, and for most purposes this is a satisfactory arrangement. However, a double row of staggered plants is sometimes recommended for a medium-sized deciduous hedge that is to be trimmed. In this arrangement, 2 rows are planted about 12 inches apart, the plants in one row being planted opposite the spaces between the plants (rather than opposite the plants) in the other row. Of course, the double row of staggered plants requires a wider space than the single row.

If you plant a deciduous hedge, cut back the young plants severely at planting time. This will induce bushiness close to the ground. The amount to cut back depends on the species and the condition of the stock, but cut all the plants to the same height. Cut off about 50 percent, on an average, of bushy plants with good low branches. If the plants are "leggy" and lack good low branches, cut them back almost to the ground.

Use only good bushy plants for evergreen hedges, and do not cut them back very severely.

CARE OF HEDGES

Cultivate or hoe your hedge as needed to keep it free of weeds and grass. If facilities are available, water the plants when they show signs of need. A few heavy irrigations that will reach the lower roots are more desirable than frequent light sprinklings. Overwatering is undesirable as it causes excessive growth and additional work in trimming. Heavy watering in late summer is especially bad as it causes late growth that may not mature before freezing weather and that will be especially subject to winter injury. However, a good irrigation in late fall before the ground freezes is beneficial to protect against winter and early spring desiccation (drying). This is especially important for evergreen hedges.

Under dryland conditions, cultivate a strip on each side of the hedge to control weeds and conserve moisture.

In soils that are excessively alkaline, some species of hedge plants will show symptoms of chlorosis; that is, the leaves turn yellow and growth of the plant is stunted. Heavy manuring sometimes aggravates the problem.

Different species of hedge plants vary markedly in their resistance to alkaline soil. On soils that are known to be excessively alkaline it is best to plant a resistant species. Resistant species include lilacs, buckthorns, salt-tree, Black Hills spruce, blue spruce, and buffaloberry.

Siberian peashrub, Russian olive, Peking cotoneaster, Tatarian honeysuckle, Rocky Mountain juniper, and eastern redcedar are all moderately resistant.

If a planted hedge shows symptoms of chlorosis, you can correct the condition by treating the soil with ferrous sulfate. Spread the ferrous sulfate (either crystals or powder) on the soil on both sides of the hedge at the rate of 1 pound of ferrous sulfate per square yard. Or place the ferrous sulfate in shallow holes about 18 inches apart on both sides of the hedge. If the foliage does not return to a healthy green color after one treatment, repeat the treatment at reduced rates at intervals until the yellow color disappears. If the weather is dry, it is desirable to apply water after the application of ferrous sulfate.

If you plant your hedge in good rich soil, you probably will not need to add fertilizer.

Very sandy soils or old rundown soils may benefit from the addition of some elements, especially nitrogen. Add the fertilizer either by cultivating compost or a limited amount of well-rotted manure into the soil or by applying a commercial fertilizer. If you use commercial fertilizer, scatter it in shallow ditches on both sides of the hedgerow.

The appearance of the hedge is the best indication as to whether fertilizer is needed. If the growth is healthy-looking and vigorous, the

addition of fertilizer especially when combined with heavy watering would cause excessive growth. However, if the growth is weak and lacks a healthy green color, fertilizer may be beneficial. Heavy mulching with manure, straw, or other organic material is likely to cause damage and is not recommended in the northern Great Plains, especially for dryland plantings.

TRIMMING HEDGES

After you cut back the plants for an untrimmed hedge at planting time, they will need little or no further trimming but can grow in their natural form.

Vigorous-growing deciduous species for trimmed hedges should be cut back after the spring growth to within 2 or 3 inches of the former cut. All other deciduous species should be cut back to that extent before growth starts in the spring of the second year.

After that, trim the hedge as needed. Cut back to within 3 or 4 inches of the former cut until the hedge reaches the desired size. Then, to keep the hedge neat in appearance and within desirable bounds, trim it once, twice, or 3 times each year to within about 1 inch or less of the former cut.

For one trimming, the date should be late in June, after the spring growth is complete. For two trimmings, the first should be around the middle of June and the second when the hedge shows need of trimming in August. For three trimmings, the dates should be early June, mid-July, and early September. In general, fast-growing species require more frequent trimming than slow-growing species.

Evergreen hedges usually are grown as untrimmed hedges. However, you can trim an evergreen hedge to a desired form by cutting back new growth in much the same way as a deciduous hedge. An evergreen hedge should not be cut back as severely as a deciduous hedge, because dead branches may result if you cut back beyond the green foliage.

Forms for Trimmed Hedges

Hedges may be trimmed to various shapes or forms (fig. 2). The shape you decide on is largely a matter of personal preference.

The square or rectangular form is most common in the northern Great Plains. However, a strong objection to this form for most species is that the lower branches do not get enough light. In time they die off and leave a "leggy" hedge, open at the bottom.

Therefore, choose a form that is wider at the base than at the top so that the lower branches will receive sufficient sunlight. Good forms may be triangular; rounded; or tapered at the sides with a narrow flat, round, or peak top. The triangular form is one of the easiest to maintain, and it is not as likely to be broken down by ice or snow as a flat-topped hedge.

RENOVATING OLD AND NEGLECTED HEDGES

Many old hedges detract rather than add to the beauty of landscape plantings because they are larger than desirable, show a lot of dead wood, or are open at the bottom. Such a neglected hedge either should

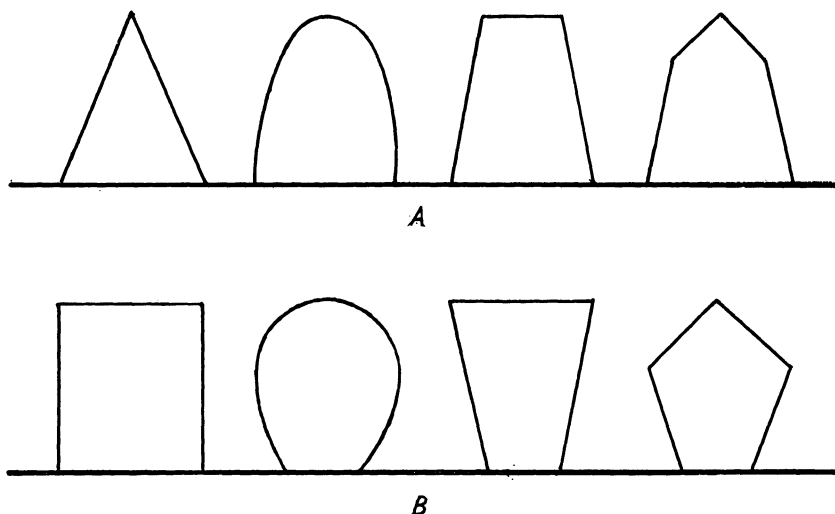


FIGURE 2.—Good and poor forms of hedges: A, Good hedge forms are broader at the base than at the top, so the lower branches receive plenty of sunlight; B, the lower branches of hedges trimmed in these forms may die because of insufficient sunlight, and the hedges will become too open at the bottom.

be pulled out and replaced by new plants or, if the plants are all alive, the hedge should be renovated by cutting it back severely.

A deciduous hedge that is too large but is well filled out at the bottom should be cut back to the desired size and shape during the dormant season and then trimmed in the usual way. However, if the hedge is open at the bottom it should be cut back almost to the ground so that it will develop a new top.

Some of the hedges at the Northern Great Plains Field Station that have made good recovery after being severely cut back are lilacs, Peking cotoneaster, Siberian peashrub, and Siberian (or Chinese) elm. Untrimmed flowering hedges, such as the Vanhoutte spirea, have made excellent recovery after being cut back almost to the ground following severe winter injury.

Conifer hedges that are no longer attractive should be pulled out, as they do not tolerate severe cutting back.

CONTROL OF INSECTS AND DISEASES

Hedges at the Northern Great Plains Field Station have suffered very little damage from insects and diseases and have seldom needed spraying.

However, hedges are subject to attack from the following three types of insects: (1) Leaf-eating insects, such as blister beetles, leaf beetles, and caterpillars; (2) insects that feed by sucking the juices, such as aphids or plant lice that attach themselves to growing shoots or leaves, and scale insects that attach themselves to the bark; and (3) insects, known as borers, that tunnel in trunks or branches.

Diseases include fire blight on *Malus* species, hawthorns, and cotoneasters; and cedar-apple rust on junipers, hawthorns, *Malus* species,

and serviceberries. Both fire blight and cedar-apple rust have been very difficult to control, but newly developed sprays may result in effective control of both diseases.

Our knowledge concerning the best methods for controlling insects and diseases changes rapidly. Therefore, for up-to-date information on identification and control of insects and diseases, write to or consult with your county extension agent or the entomologist at your State agricultural college. Remember that your hedge will be less subject to attack if you maintain it in a vigorous growing condition than if you neglect it.

SELECTION OF SPECIES FOR HEDGES

Because of the severe climate in the northern Great Plains, it is obvious that only the hardiest and most drought-resistant species should be selected for hedge purposes. The ability of the species to withstand drought is especially important if water is not available for irrigation. A good hedge cannot be developed if some of the plants winterkill or die from drought, so borderline species should not be chosen.

However, many species of plants may be used for hedges. In general, varieties with small leaves are preferable for low hedges used as borders or as foreground plantings for groups of shrubbery, whereas species with large leaves are more suitable for either trimmed or untrimmed background hedges. Leaves of 14 varieties of hedge plants are shown in figure 3.

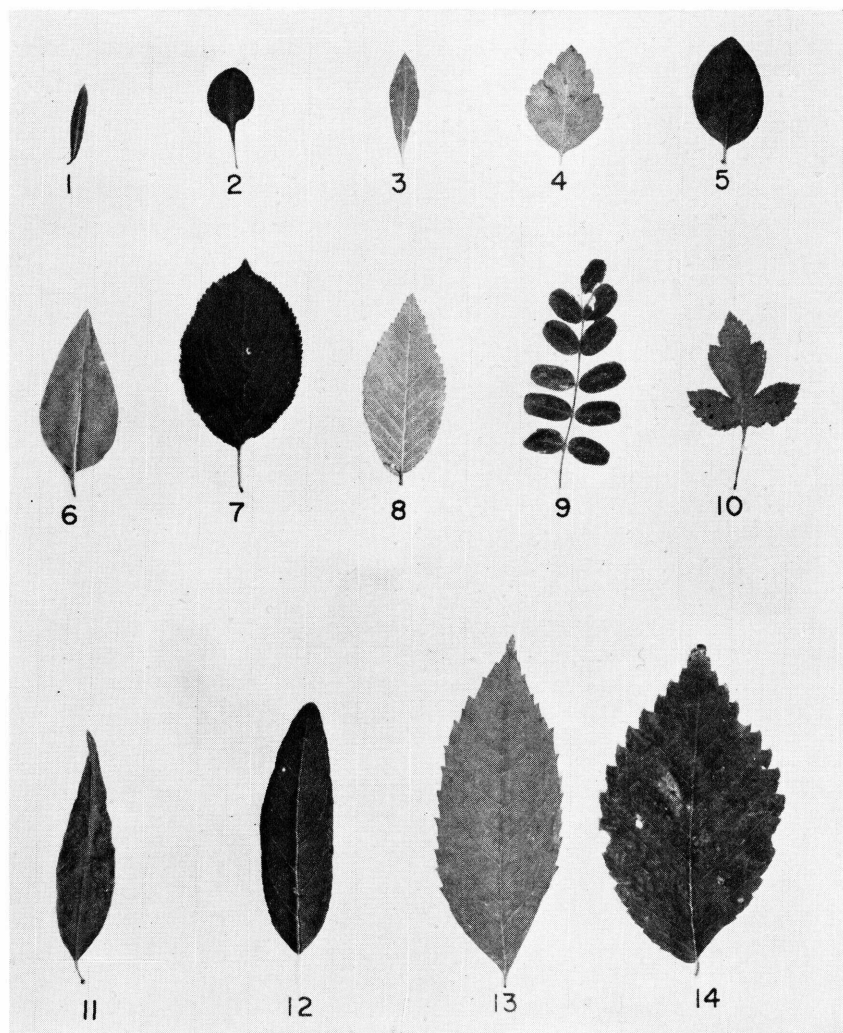
DESCRIPTION AND EVALUATION OF SPECIES

Information on species described and evaluated for hedge purposes in the northern Great Plains is based, for the most part, on data obtained in hedge tests at the Northern Great Plains Field Station. A few of the species described were not tested in the hedge tests at the station but were grown elsewhere on the station grounds. Additional information was obtained in the area.

These descriptions and evaluations apply only to the northern Great Plains. Also, they are not to be considered entirely conclusive. Some species have not been tested for a long enough time. And even when the recommendations are based on observations of 20 years or more, they are subject to change as a result of insect infestations, diseases, or unpredictable climatic conditions.

Some of the species tested at the Mandan station were found to be undesirable because they lacked hardiness or for some other reason. *The following species should not be planted for hedge purposes in the northern Great Plains:* Russian almond, gray birch, Bessey cherry (also called western sandcherry), purpleleaf sandcherry, black chokeberry, American golden elder, ural falsespirea, common ninebark, goldleaf ninebark, the privets, Japanese rose, Bumalda spirea, Japanese white spirea, subalpine spirea, wayfaring tree (a viburnum), sharpleaf willow, diamond willow, laurel willow, and oldman wormwood (also called southernwood).

Suitable varieties for trimmed and untrimmed hedges are listed on pages 10-12. Vines for use as substitutes for hedges are listed on page 13. If you choose one of the recommended varieties and follow carefully the instructions given here for planting and taking care of your hedge, you should be able to develop a healthy hedge and it should be attractive for many years.



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FIGURE 3.—Leaves of 14 varieties of plants suitable for hedge purposes in the northern Great Plains: (1) Dwarf arctic willow, (2) Japanese barberry, (3) Garland spirea, (4) Vanhoutte spirea, (5) Peking cotoneaster, (6) Chinese lilac, (7) Common buckthorn, (8) Siberian elm, (9) Siberian peashrub, (10) Tibetan crabapple, (11) Cherry prinsepia, (12) Russian olive, (13) Green ash (leaflet), (14) American elm. Natural size of the leaves may be judged from the leaf of the Dwarf arctic willow, which was 1 inch long.

List of varieties suitable for untrimmed hedges in the northern Great Plains

Type of hedge and variety	Should be watered	Attractive bloom	Orna-mental fruit	Color- ed fall foliage	Color- ed bark in winter	Food for hu- mans	Food for birds	Thorny	Ever- green	De- scribed on page
Low (6 feet or less):										
Alpine currant (<i>Ribes alpinum</i> L.) ¹										19
Billiard spirea (<i>Spiraea billiardii</i> Herincq.)	✓	✓								31
Cherry prinsepia (<i>Prinsepia sinensis</i> Oliv.) ¹							✓	✓		30
Clove currant (<i>Ribes odoratum</i> Wendl.)		✓	✓			✓	✓			19
Dwarf ninebark (<i>Physocarpus opulifolius</i> var. <i>nanus</i> (Kirchn.) Zabel)	✓	✓								28
Garland spirea (<i>Spiraea arguta</i> Zabel) ¹		✓								31
Golden currant (<i>Ribes aureum</i> Pursh.)		✓				✓	✓			19
Japanese barberry (<i>Berberis thunbergii</i> DC.)	✓		✓			✓	✓	✓		14
Korean bushcherry (<i>Prunus japonica</i> Thunb.)	✓		✓	✓		✓	✓			16
Korean spirea (<i>Spiraea trichocarpa</i> Nakai.)		✓								32
Peking cotoneaster (<i>Cotoneaster acutifolia</i> Turcz.) ¹			✓				✓			16
Pygmy peashrub (<i>Caragana pygmaea</i> DC.) ¹		✓						✓		28
Redosier dogwood (<i>Cornus stolonifera</i> Michx.)	✓	✓			✓		✓			19
Rugosa rose (<i>Rosa rugosa</i> var. <i>alba</i> W. Robins and var. <i>rubra</i> Rehd.)	✓	✓	✓				✓	✓		30
Running serviceberry (<i>Amelanchier stolonifera</i> Wiegand.) ²		✓	✓				✓			31
Russian peashrub (<i>Caragana frutex</i> (L.) K. Koch.)		✓				✓	✓			28
Siberian salt-tree (<i>Halimodendron halodendron</i> (L.) Voss.)		✓						✓		30
Vanhoutte spirea (<i>Spiraea vanhouttei</i> (Briot) Zabel.) ¹		✓								32
Medium (6 to 12 feet tall):										
American cranberry bush (<i>Viburnum trilobum</i> Marsh.)	✓	✓	✓			✓	✓			33
Amur honeysuckle (<i>Lonicera maackii</i> Maxim.) ¹		✓	✓				✓			23
Chinese lilac (<i>Syringa chinensis</i> Willd.) ¹		✓								24
Cockspur hawthorn (<i>Crataegus crusgalli</i> L.)		✓					✓	✓		23
Common lilac (<i>Syringa vulgaris</i> L.)		✓								26

*List of varieties suitable for trimmed hedges in the northern
Great Plains*

Type of hedge and variety	Should be watered	Colored fall foliage	Thorny	Ever- green	De- scribed on page
Low (1 to 3 feet tall):					
Alpine currant (<i>Ribes alpinum</i> L.) ¹ -----					19
Dwarf arcticwillow (<i>Salix purpurea nana</i>)-----	✓				34
Dwarf ninebark (<i>Physocarpus opuli- folius</i> var. <i>nanus</i> (Kirchn.) Zabel.)-----	✓				28
Japanese barberry (<i>Berberis thunbergii</i> DC.)-----	✓	✓	✓		14
Korean bushcherry (<i>Prunus japonica</i> Thunb.)-----	✓	✓			16
Pygmy peashrub (<i>Caragana pygmaea</i> DC.) ¹ -----			✓		28
Medium (3 to 5 feet tall):					
Cherry prinsepia (<i>Prinsepia sinensis</i> Oliv.) ¹ -----			✓		30
Chinese hawthorn (<i>Crataegus pinna- tifida</i> Bunge) ² -----	✓		✓		21
Common buckthorn (<i>Rhamnus cathar- tica</i> L.) ^{1 3} -----			✓		14
Flowering plum (<i>Prunus triloba</i> forma <i>simplex</i> (Bunge) Rehd.)-----	✓				29
Littleleaf peashrub (<i>Caragana micro- phylla</i> var. <i>Mandshurica</i> Kom.)-----					28
Peking cotoneaster (<i>Cotoneaster acuti- folia</i> Turcz.) ¹ -----					16
Russian olive (<i>Elaeagnus angustifolia</i> L.)-----			✓		20
Siberian currant (<i>Ribes diacanthum</i> Pall.)-----	✓				19
Siberian peashrub (<i>Caragana arbo- rescens</i> Lam.)-----					28
Silver buffaloberry (<i>Shepherdia argen- tea</i> Nutt.)-----			✓		15
Tibetan crabapple (<i>Malus toringoides</i> (Rehd.) Hughes) ² -----			✓		18
High (over 5 feet tall):					
American elm (<i>Ulmus americana</i> L.)-----					20
Amur maple (<i>Acer ginnala</i> Maxim.)-----	✓	✓			27
Black Hills spruce (<i>Picea glauca</i> var. <i>densata</i> Bailey)-----				✓	33
Blue spruce (<i>Picea pungens</i> Engelm.)-----				✓	33
Boxelder (<i>Acer negundo</i> L.)-----					27
Chinese lilac (<i>Syringa chinensis</i> Willd.) ¹ -----					24
Eastern redcedar (<i>Juniperus virgi- niana</i> L.) ^{1 4} -----				✓	24
Green ash (<i>Fraxinus pennsylvanica</i> var. <i>lanceolata</i> (Borkh.) Sarg.)-----					13
Hungarian lilac (<i>Syringa josikaea</i> Jacq.)-----	✓				26
Japanese tree lilac (<i>Syringa amurensis</i> var. <i>japonica</i> (Maxim.) Franch. & Savat.) ¹ -----					26
Rocky Mountain juniper (<i>Juniperus</i> <i>scopulorum</i> Sarg.) ^{1 4} -----				✓	24
Siberian (or Chinese) elm (<i>Ulmus</i> <i>pumila</i> L.) ¹ -----					21

¹ Rates among best for hedge purposes.

² Alternate host of cedar-apple rust; should not be planted near redcedars or junipers.

³ Alternate host of crown rust of oats; should not be planted in districts where oats are commonly grown.

⁴ Alternate host of cedar-apple rust; should not be planted near *Malus*, *Crataegus*, or *Amelanchier* species.

*List of vines that may be grown as substitutes for hedges in the
northern Great Plains*

Variety	Needs prun- ing	At- trac- tive fall foliage	Orna- men- tal fruit	Food for birds	De- scribed on page
American bittersweet (<i>Celastrus scandens</i> L.)	-----	-----	√	√	34
Western virginsbower (<i>Clematis ligusticifolia</i> Nutt.)	-----	-----	√	-----	34
Virginia creeper (or Woodbine) (<i>Parthenocissus quinquefolia</i> (L.) Planch.)	√	√	-----	-----	34
Engelmann Virginia creeper (<i>Parthenocissus quinquefolia</i> var. <i>engelmanni</i> (Graebn.) Rehd.)	√	√	-----	-----	34
Native frost grape (<i>Vitis vulpina</i> L.)	-----	-----	√	√	34

Ash



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FIGURE 4.—Green ash hedge: Age, 19 years; height, 6 feet; width, 4½ feet.

GREEN ASH (fig. 4) is hardy and drought-resistant. It is useful where a large trimmed hedge is desired. It grows slowly and is too open when young to be a good hedge. However, as it grows older the foliage becomes denser, and it attains a height and spread of from 7 to 8 feet. It makes a very fine, upright, dense, and fairly narrow hedge, suitable when a tall screen or shelter is wanted. Older hedges make a good recovery when they are cut back to about 4 feet in height and width.

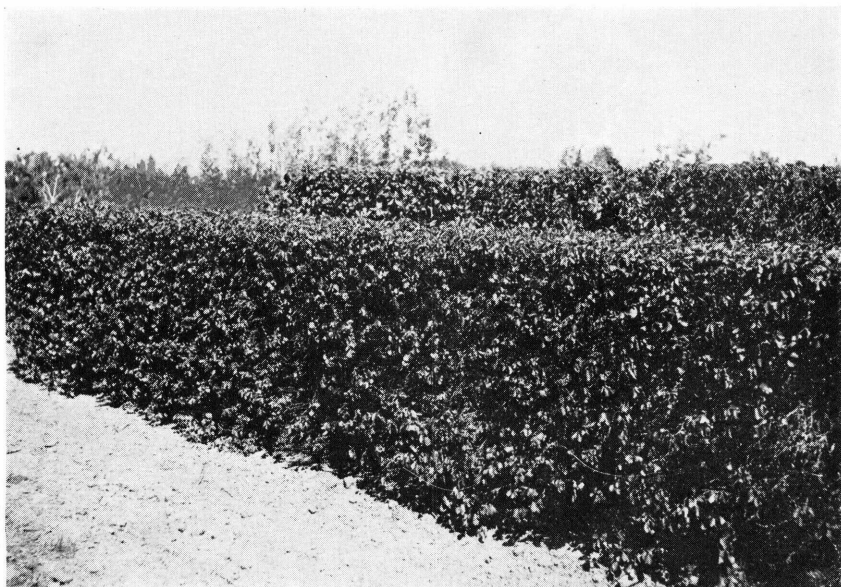
Barberry

JAPANESE BARBERRY can be grown either as a low untrimmed hedge or as a small trimmed hedge. Untrimmed, it reaches a height and spread of from 2 to 3 feet. Trimmed, it will be about 2 feet high and 2 feet wide. It is a thorny shrub; its foliage becomes an attractive red in the fall; and its bright red berries cling through the winter. Although it thrives well when watered, it does not thrive under dry-land conditions and it is subject to killing back during severe winters. Because it appears to lack drought resistance, and because it is a borderline plant so far as hardiness is concerned, it is not recommended for general planting in the northern Great Plains unless water is available for irrigation.

Buckthorn

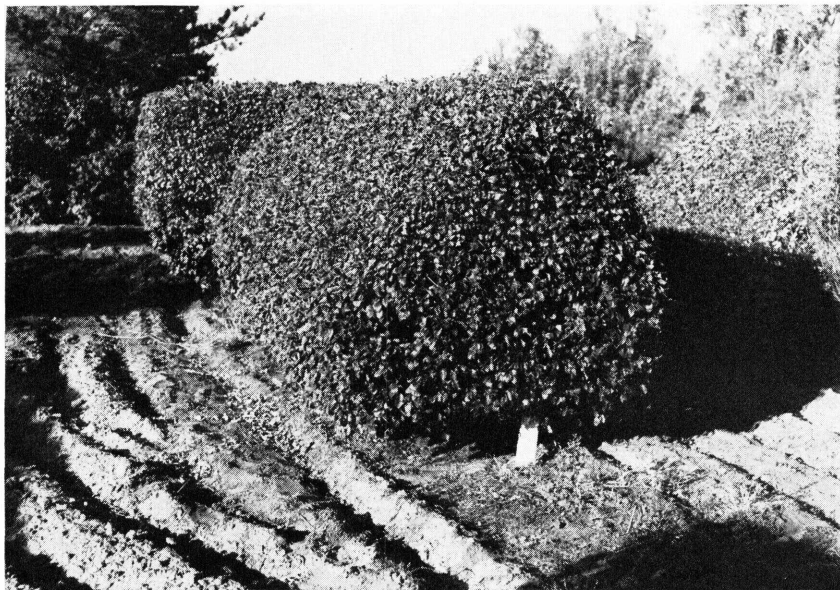
COMMON BUCKTHORN is hardy and drought-resistant. It is one of the best hedge plants for the northern Great Plains, for either a formal or an informal hedge. Untrimmed, it grows to a height of 10 to 15 feet and makes a good windbreak or tall screen. Its thorny branches make it a good barrier. It can be used as a tall trimmed hedge, 6 to 8 feet in height and width, or it can be trimmed to a smaller size, 3 to 4 feet in height and width.

Common buckthorn has been tested as a trimmed hedge at the Mandan station since 1915. It has made an attractive dense hedge at all times (figs. 5 and 6). It has never suffered serious injury from either



PN-209

FIGURE 5.—Common buckthorn hedge: Age, 19 years; height, $4\frac{1}{2}$ feet; width, 4 feet.



PN-210

FIGURE 6.—Same hedge shown in figure 5 after part had been changed to pyramidal form of trimming: Age, 40 years; height, 6 feet; spread, 6 feet.

cold or drought and has maintained good foliage near the bottom. It was severely cut back in 1947 but made a good recovery and now measures about 6 feet in height and width.

Unfortunately, this species serves as an alternate host of crown rust of oats, a disease that may greatly damage an oat crop. Therefore, common buckthorn should not be planted in an oat-growing area.

DAHURIAN BUCKTHORN is a thorny deciduous shrub; it is hardy and drought-resistant. It is suitable for use as a windbreak and makes a good informal hedge. It grows to a height of 12 to 16 feet. Its leaves are lighter green than the common or glossy buckthorns. Its berries furnish food for the birds. It does not make a good trimmed hedge because of its open growth. Although it is immune or highly resistant to present races of crown rust of oats, it is possible that it might be susceptible to some new race and it should not be planted in an oat-growing district.

GLOSSY BUCKTHORN is a deciduous shrub; it is moderately hardy and drought-resistant. It shears well and makes an attractive formal hedge of medium size (3 to 5 feet tall); or it can be grown as an informal hedge 6 to 12 feet tall. It has glossy green foliage and dark red berries. Glossy buckthorn, like Dahurian buckthorn, is immune or highly resistant to present races of crown rust of oats. However, it should not be planted where oats are grown as it may be susceptible to some new race.

Buffaloberry

SILVER BUFFALOBERRY is native to the northern Great Plains. The silver-gray color of its foliage makes a pleasing con-

trast to the green color of most other species. It is desirable as a trimmed hedge 3 to 4 feet in height. As an untrimmed hedge it grows to a height of 12 or 14 feet and a width of 16 feet. Numerous thorns make it a good barrier. It is moderately hardy and drought-resistant. Although it kills back severely in drought years, it makes good recovery. There are both male and female plants. The females produce attractive red berries which can be made into jelly and which also furnish food for the birds. However, in order to obtain fruit, plants of both sexes must be included in the hedge.

Cherries

KOREAN (or CHINESE) BUSHCHERRY may be useful as a small hedge with good fall color if irrigation is feasible, but it does not do well under dryland conditions. Its fruit is good for pies, jelly, or sauce, and it is liked by the birds. A formal hedge of this species was planted at the Mandan station in 1949. It is attractive and has maintained good foliage close to the ground. Winter injury has not been severe except for considerable killing back in the winter of 1952-53. The hedge was about 2 feet in height and 1½ feet in width at 6 years of age.

MANCHU (or NANKING) CHERRY is drought-resistant but not entirely hardy. It makes an attractive small hedge for several years, but winter injury often gives it a ragged appearance as it gets older and it becomes too open at the bottom. Trimmed hedges will be from 2 to 3½ feet in height and width. Untrimmed hedges reach a height and spread of 5 to 6 feet. They, too, are attractive when young. Their pink or white blossoms are followed by bright red fruit that is desirable for jelly, jams, juice, and pies. However, older hedges become irregular and unattractive because of winter injury and loss of some of the plants. Although comparatively drought-resistant, this species does benefit from water in dry seasons, and under such conditions might make an acceptable trimmed or untrimmed hedge.

NATIVE CHOKECHERRY is fairly hardy and drought-resistant. As an untrimmed hedge, it grows to a height of 14 to 18 feet and makes a good windbreak or tall screen. It has an attractive spring bloom, and its fruit makes excellent jelly or jam in addition to furnishing food for the birds. It can be trimmed to a height and width of about 5½ feet, but it is coarse in texture. Its suckering habit keeps the hedge fairly well filled out at the bottom, but it suffers considerable winter injury at times and dead branches give it a ragged and irregular appearance. This species is sometimes attacked by a disease called "virus X" which kills individual plants in a few years.

Cotoneasters

PEKING COTONEASTER is very hardy and drought-resistant and makes one of the best small to medium-sized trimmed hedges for the northern Great Plains (figs. 7 and 8). It withstands severe winters and drought without apparent injury. Its small shiny leaves appear early in the spring and remain green until late in the fall. Its dense growth habit from top to bottom makes it a very attractive



PN-211

FIGURE 7.—Peking cotoneaster hedges: *Foreground*, rounded form; *upper right*, square form; age, 10 years; height, 2 feet; width, 2 feet.

hedge. It also produces small berries that turn black on maturing. It can be trimmed to about $2\frac{1}{2}$ to 4 feet in height and width and will not become leggy even when it is trimmed in the square form. Peking cotoneaster suffers from attacks of oystershell scale in some parts of



PN-212

FIGURE 8.—Peking cotoneaster hedge: Age, 40 years; height, 3 feet; width, 3 feet.

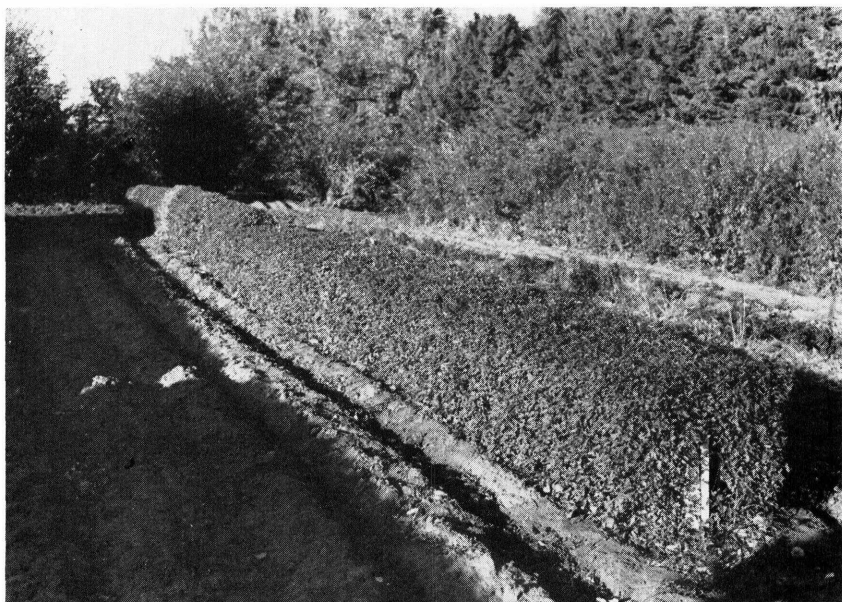
the area, but this insect can be controlled by dormant sprays of lime sulfur. Also, an unidentified species of leaf roller sometimes kills the leaves and causes unsightly webbing. This pest can be controlled by dusting or spraying with DDT.

Other species of cotoneaster tested at Mandan as trimmed hedges lacked hardiness. Two foreign plant introductions of cotoneaster species, P. I. 103096 and 103097, have been growing in the station arboretum as untrimmed plants since 1939 but have not been tested as trimmed hedges. Both have been very hardy and drought-resistant and have not been attacked by the leaf roller that damages Peking cotoneaster hedges. Their foliage and growth habits closely resemble Peking cotoneaster, and it is thought that they would make excellent hedge material.

MULTIFLORA COTONEASTER has been used successfully for hedge purposes in Canada and South Dakota and may have merit for use in the northern Great Plains. It is one of the few species of the genus that bear showy flowers. The blooms are made up of small white flowers borne in loose clusters the latter part of April. These are followed by heavy crops of red fruit.

Crabapple

TIBETAN CRABAPPLE (fig. 9) should make a good medium-sized hedge for the northern Great Plains. However, nursery stock is scarce. One Tibetan crabapple plant was received at the Mandan station in 1923. This tree has attained a height and spread of about 15 feet and has been hardy and drought-resistant except for some kill-



PX-213

FIGURE 9.—Tibetan crabapple hedge: Age, 7 years; height, $2\frac{1}{2}$ feet; width, 2 feet.

ing back in severe winters. In 1948, seedlings of this tree were planted in the trimmed hedge test block at the station. The hedge has been hardy and drought-resistant and has not shown any tendency to become leggy at the bottom. At 7 years of age the square section measures about 2½ feet in height and width and the pyramid section is about 2½ feet high and 2 feet wide at the base. This species is subject to fire blight, and it is probably an alternate host of cedar-apple rust so it should not be planted close to redcedars or junipers.

Currants

ALPINE CURRANT is a dense, bushy shrub that is moderately hardy and drought-resistant. As an untrimmed hedge it grows to about 2 or 3 feet in height and width. It does not suffer severe killing back, but it may fail to survive severe drought. It shears well and makes a low, dense, formal hedge. It is recommended for this purpose, especially if watering is feasible.

GOLDEN CURRANT and **CLOVE CURRANT** are similar in appearance except that golden currant is smaller and more slender in growth. Although these currants suffer considerable killing back in severe drought, they make hardy, quick-growing, informal hedges except for being a little too open at the bottom. They grow to a height of 5 or 6 feet and a spread of 6 or 7 feet. Their yellow, fragrant spring blossoms are followed by small black fruit that makes excellent jelly or jam. Although they are too open at the bottom to make desirable trimmed hedges, they sometimes are used as trimmed hedges about 3 feet tall. These currants are subject to a bacterial disease that kills the canes. However, individual plants differ in their susceptibility to the disease so vegetatively propagated plants of resistant bushes should be used for hedge purposes.

SIBERIAN CURRANT (fig. 10) is moderately hardy and drought-resistant. Under dryland culture it makes a very attractive hedge for about 10 years but tends to suffer from drought and winter injury as it grows older and may become too open at the bottom and ragged in appearance. It attains a height of from 3 to 4 feet and makes a fair to good recovery when severely cut back. Where watering is possible, it should make a good trimmed hedge. It is the first hedge to leaf out in the spring, is of dense growth, and the small shiny leaves are attractive. Untrimmed, it grows about 7 feet in height and 10 feet in width under dryland conditions but becomes somewhat ragged in appearance.

Dogwoods

REDOSIER DOGWOOD has some merit as an untrimmed hedge if water is available for irrigation. It is subject to drought injury and suffers a considerable amount of winterkilling, especially after dry summers, and it may become uneven and ragged in appearance. Under dryland culture it attains a height of 6 to 8 feet and a width of 6 to 12 feet, but it grows taller if it is watered. It has a long blooming period in the summer and the leaves turn to a deep red in the fall. The red bark of the branches add color to the landscape in the winter. For the best winter coloring, the hedge should be cut back severely



PN-214

FIGURE 10.—Siberian currant hedge: Age, 11 years; height, $2\frac{1}{2}$ feet; width, $2\frac{1}{2}$ feet.

in the spring. The long new shoots that develop will be more brightly colored than the older wood.

SIBERIAN DOGWOOD makes an attractive trimmed hedge when young. However, many of the plants are killed by the severe winters and droughts in the northern Great Plains. Therefore, it is not recommended for planting in this area, at least under dryland conditions.

Elaeagnus

RUSSIAN OLIVE may be grown as a medium-sized trimmed hedge (fig. 11) or as a tall screen and windbreak. Its silvery leaves, berries, and small branches make a pleasing contrast with the common green foliage of other species. Its berries furnish food for the birds, and its thorns make it a good barrier. As a trimmed hedge, it averages 4 to 5 feet in height with a spread of 5 to 6 feet. Untrimmed, it attains a height of 15 feet or more. When young it makes a fine-appearing hedge. With age it takes on considerable spread, is inclined to woodiness with sparse foliage, and may winterkill. When the dead branches are removed it is open and leggy and does not present a neat appearance. It makes a good recovery, however, if it is severely cut back.

Elms

AMERICAN ELM is hardy and drought-resistant. At the Mandan station, where it has been tested as a trimmed hedge since 1915, it has never suffered severe winterkilling or drought injury, and it has



PN-215

FIGURE 11.—Russian olive hedge: Age, 19 years; height, 4 feet; width, 4½ feet.

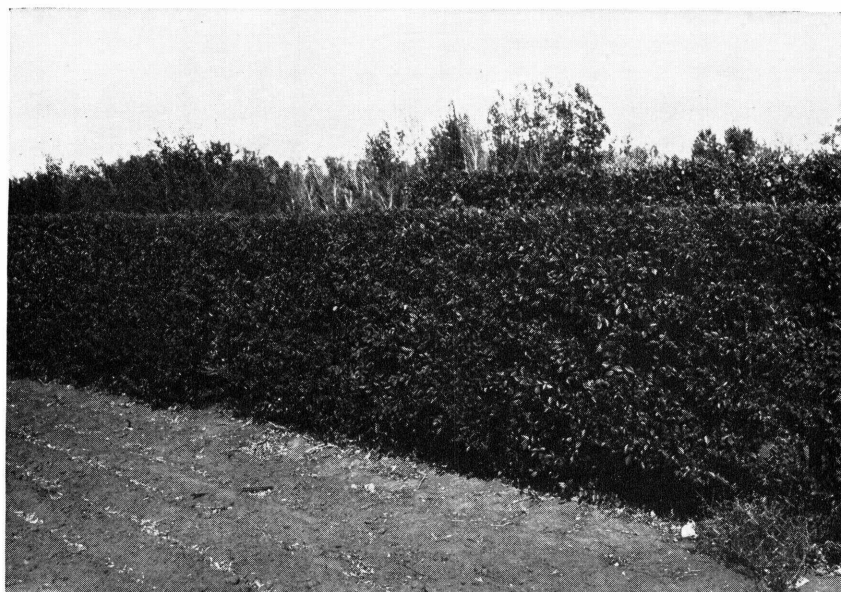
kept dense green foliage close to the ground. It makes good recovery following severe cutting back. It measures from 4 to 7 feet in height, depending on the shape of trimming, and about 7 feet in width. Although it is a little coarse in texture to make the best looking formal hedge, it is useful where a large hedge is desired for wind protection or as a background for other plantings.

SIBERIAN (or CHINESE) ELM can be grown as a trimmed hedge (figs. 12 and 13) and is recommended when a quick-growing tall hedge is desired for shelter, screen, or background purposes. This species is hardy and drought-resistant. It makes a very good recovery after it has been cut back severely. It should not be planted in low, wet places; and it should not be heavily watered, especially in late summer, as the resulting late growth may be damaged by early fall freezes.

Some strains of Siberian elm are hardier than others. The strain known as Harbin or Dropmore has proved to be of superior hardiness in certain parts of Canada and should be purchased if available.

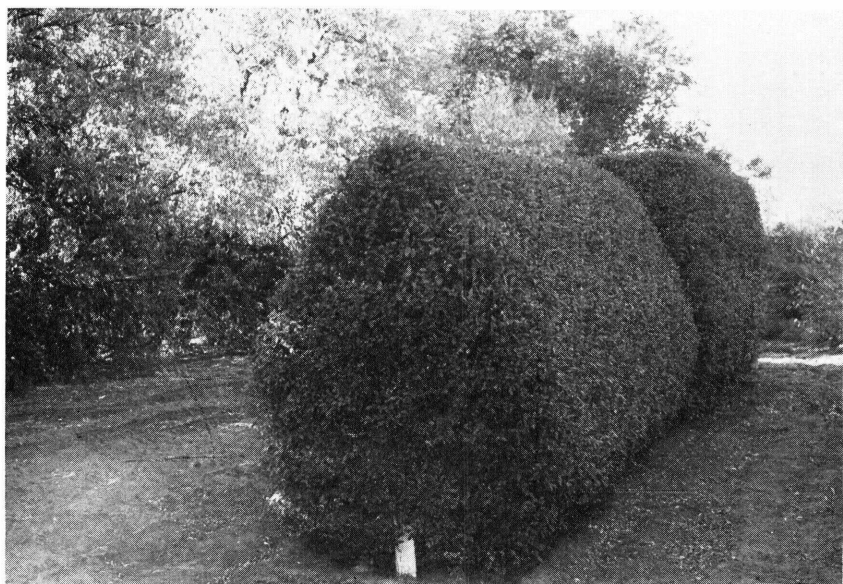
Hawthorns

CHINESE HAWTHORN is reasonably hardy and drought-resistant in the northern Great Plains. It has an attractive bloom and is thorny. Older trees at the Mandan station showed considerable dead wood after the drought of 1936, but they made a good recovery when conditions returned to normal. As an untrimmed hedge it grows to a height of 12 feet, or it can be trimmed to a height and spread of from 3 to 5 feet. When it is trimmed in the square form (fig. 14), it tends to become leggy at the bottom; but this might be prevented by



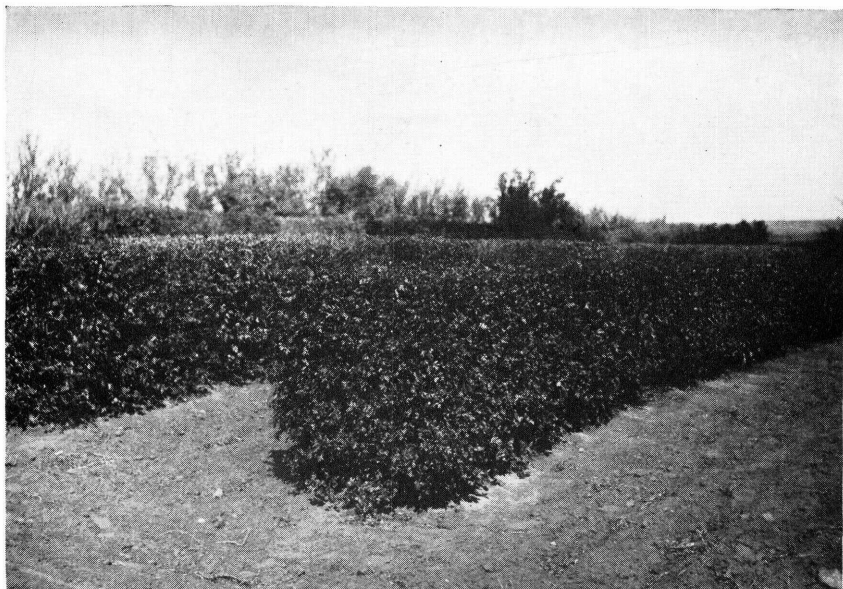
PN-216

FIGURE 12.—Siberian elm hedge: Age, 11 years; height, 5 feet; width, $4\frac{1}{2}$ feet.



PN-217

FIGURE 13.—Same Siberian elm hedge shown in figure 12 after part of it had been changed to the pyramid form: Age, 29 years; height, $8\frac{1}{2}$ feet; width, 6 feet.



PN-218

FIGURE 14.—Chinese hawthorn hedge: Age, 13 years; height, $3\frac{1}{2}$ feet; width, 3 feet.

trimming in the pyramid or rounded form. It is subject to fire blight, and it should not be planted close to redcedars or junipers as it is an alternate host of cedar-apple rust.

COCKSPUR HAWTHORN is hardy and drought-resistant. It maintains its branches close to the ground and makes a good tall screen and thorny barrier. Its attractive bloom is followed by ornamental fruit. An untrimmed hedge of this species that was planted at the Mandan station in 1917 has grown to a height and spread of 10 to 12 feet. It should not be planted near redcedars or junipers as it is an alternate host of cedar-apple rust.

Honeysuckles

AMUR HONEYSUCKLE is hardy and drought-resistant. It has dark green foliage that does not assume the dull color in midsummer that is so often found in varieties of Tatarian honeysuckle. Its bloom consists of rather coarse, large white flowers. Its red fruits persist to midwinter. It attains a height of $6\frac{1}{2}$ to 9 feet and a spread of 6 to 7 feet. Because of its comparatively large size, it is suggested for border, mass, and screen plantings rather than for foundation plantings. One noticeable characteristic of Amur honeysuckle is the very rapid growth of the young plants.

MANCHURIAN HONEYSUCKLE is another hardy honeysuckle that can be used as an untrimmed hedge. It attains a height of 5 feet and a spread of 8 feet.

TATARIAN HONEYSUCKLE may be used as either a formal or an informal hedge. Untrimmed, it grows to a height of 10 or 12 feet; trimmed, it attains a height and spread of about 5 feet. It is hardy and drought-resistant under most conditions, and the flowers and red berries help make the untrimmed hedge attractive. Its chief fault is that it tends to become leggy and open at the bottom. Care must be taken to develop and preserve low branches.

Tatarian honeysuckle has been tested as a trimmed hedge at the Mandan station since 1915. It has been hardy and drought-resistant except for some killing back during the drought years of the mid-thirties. It had attained a height and spread of about 6 feet by 1954 when it was cut back severely. It now measures a little over 1½ feet in height and width in the pyramid section and almost 3 feet in height and width in the square section. Both sections, but especially the square one, are too open at the bottom.

ZABELI HONEYSUCKLE, a variety of the Blueleaf honeysuckle, has blue-green leaves and attractive red flowers and red berries. It is hardy and is one of the most attractive of the honeysuckles for a flowering informal hedge.

Junipers

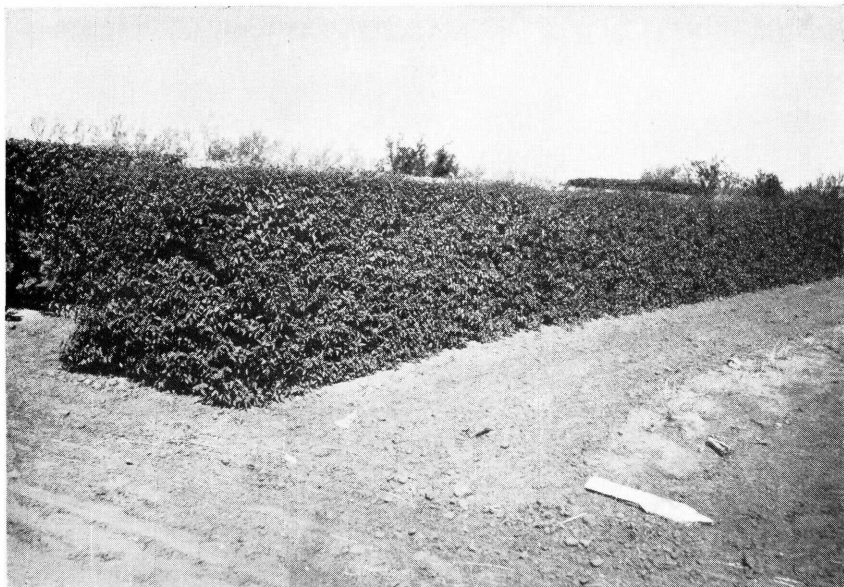
EASTERN REDCEDAR is hardy and drought-resistant. It is often used as a tall screen or windbreak. However, it can be trimmed to any height between 2½ and 8 feet, to make a formal hedge. Redcedars are alternate hosts of cedar-apple rust. Therefore, they should not be planted close to apples, hawthorns, or serviceberries.

ROCKY MOUNTAIN JUNIPER is one of the best of the evergreens for hedge purposes. It is hardy and resistant to both drought and cold. It makes an excellent trimmed hedge and is also desirable for use as a tall informal screen or windbreak. Sheared hedges of this species are from 3 to 8 feet tall. It is subject to infection by cedar-apple rust and therefore should not be planted near apples, hawthorns, or serviceberries.

Lilacs

CHINESE LILAC (figs. 15 and 16) is hardy and drought-resistant. It is adapted to wide use around farm homes either as a trimmed or as an untrimmed hedge. It is valuable for foundation, border, screen, or windbreak plantings. Its suckering habit keeps it green close to the ground, and it makes a good recovery after it has been cut back severely.

Chinese lilac is one of the most attractive of the large trimmed hedges; it attains a height and spread of 5 to 8 feet. However, it can be trimmed to form a smaller, narrower hedge, about 2½ to 3 feet in height and spread, which would be easier to trim and take care of. It also makes an excellent flowering untrimmed hedge. Its lavender bloom is neither so large nor so fragrant as some of the other varieties of lilac, but its blooms appear in great abundance year after year. It grows to large size and takes up considerable space, reaching a height and spread of about 10 feet.



PN-219

FIGURE 15.—Chinese lilac hedge: Age, 19 years; height, 5 feet; width, $5\frac{1}{2}$ feet.



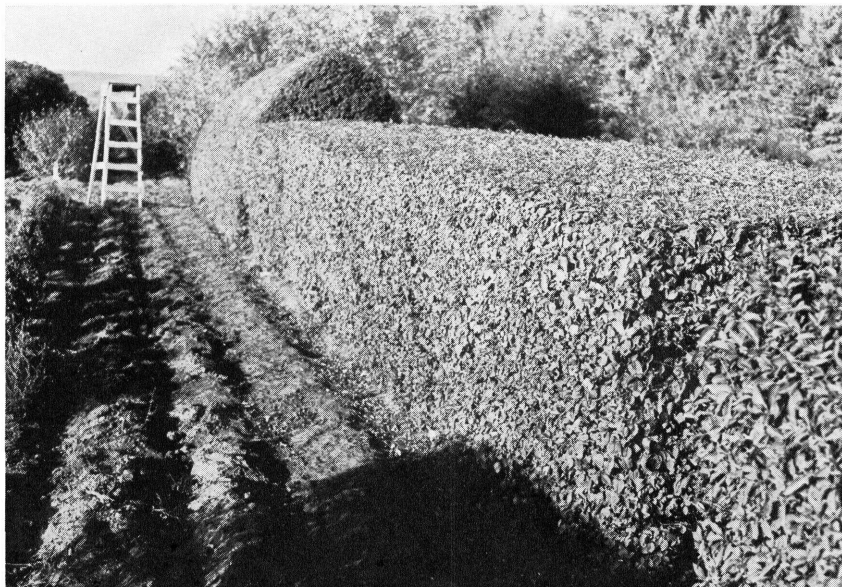
PN-220

FIGURE 16.—Same Chinese lilac hedge as shown in figure 15 after it had been changed to rounded form: Age 40 years; height, 8 feet; width, 8 feet.

COMMON LILAC is used extensively in the northern Great Plains for both trimmed and untrimmed hedges. It is hardy and drought-resistant. However, it does not make the best formal hedge because of its coarse texture and because it suckers badly. Untrimmed, it makes a good dense hedge growing to a height of 10 feet or more. However, some of the other lilacs including the French Hybrids (of which the common lilac is a parent) are more attractive in bloom. There are many good varieties of **French Hybrid lilacs**. Among these are Edith Cavelle and Mme. Lemoin (white); Chas. X (delicate purple); Paul Thereon, (reddish); and Ludwig Spaeth and Charles Joly (purple).

HUNGARIAN LILAC is attractive either as a trimmed or as an untrimmed hedge where water for irrigation is available, but it is not adapted to dryland culture. In tests at the Mandan station under dryland conditions, the hedge killed back severely in dry years and never attained a height of more than 3 feet before most of the plants were killed by drought in 1936. However, under irrigation, this lilac makes a large hedge that can be trimmed to from 5 to 7 feet in height. Its upright, narrow growth and glossy foliage make it pleasing in appearance.

JAPANESE TREE LILAC is very hardy and drought-resistant. It makes a large trimmed hedge that stays green close to the ground. It has been grown at the Mandan station since 1915 both as a trimmed hedge and as an untrimmed hedge. At Mandan, it is trimmed to a height of 4 to 6 feet and a width of 6 feet (fig. 17). It can be trimmed to form a narrower hedge, which would make it easier to shear and



PN-221

FIGURE 17.—Japanese tree lilac hedge: Age, 40 years; *Foreground (square form)*, height, 4 feet; width, 6 feet; *Rear (rounded form)*, height, 6½ feet; width, 6 feet.

take care of. It makes a very good recovery after severe cutting back. As an untrimmed hedge, it measures about 12 feet high and 11 feet wide. It has an attractive white flower but is too open at the bottom to make the best hedge.

KOREAN EARLY LILAC is hardy and drought-resistant. It makes a good informal hedge, growing to a height and width of about 10 feet. It has a fragrant white bloom in the spring and red foliage in the autumn. Its large leaves make it unsuitable for use as a trimmed hedge.

LATE (or HIMALAYAN) LILAC, like the Hungarian lilac, may be useful for hedge purposes where water is available for irrigation. However, it is not drought-resistant and kills back after a dry fall. It grows in much the same way as the Hungarian lilac but is bushier and more robust. As a dryland trimmed hedge, it measures about $3\frac{1}{2}$ to 4 feet in height and 3 to $3\frac{1}{2}$ feet in width, but attains a height of 5 feet or more under irrigation.

Maples

AMUR (or GINNALA) MAPLE can be used as a medium-sized or large trimmed hedge, or it can be left untrimmed for use as a tall screen. It is a small bushy tree with small leaves, and it is ornamental at all times of the year but especially in the fall when its leaves turn deep red. It needs watering, especially in dry seasons, and it tends to become leggy unless the pyramid or rounded form of trimming is used.

BOXELDER is hardy and makes a large dense trimmed hedge about 6 or 7 feet tall and 5 or 6 feet wide. It shears well, especially when young. It is easy to propagate and low in cost, factors that make it desirable when a large hedge is wanted for use as a screen or wind-break or as a background planting. However, its coarse branches and foliage make it suitable only for these uses. It needs to be watered in very dry years.

SILVER (or SOFT) MAPLE does not endure drought very well, but it may be useful as a screen or large hedge if water for irrigation is available. Irrigated trees will live for many years; nonirrigated trees will have a lot of dead wood. It shears well but cannot be kept to small proportions. At the Mandan station, this species reached an average height of 10 feet and a spread of 5 to 6 feet in 10 years.

Mockorange

SWEET MOCKORANGE is not recommended for hedge purposes in the northern Great Plains, at least under dryland culture. It might make a good hedge in the milder sections of the area if water is available for irrigation. It is subject to severe killing back most winters, but it makes a fair to good recovery following cutting back in the spring. It tends to be a little open at the bottom, and if it does not get enough water in the summer it loses its leaves. This gives it a ragged appearance. If it is well watered it retains its heavy foliage throughout the season. Its white fragrant blooms are borne

in groups. Untrimmed, it grows to a height of 9 or 10 feet; trimmed, it attains a height and spread of 5 to 6 feet.

Ninebark

DWARF NINEBARK is probably the best ninebark for hedge purposes for the northern Great Plains. It is finer textured than the common ninebark and has an attractive bloom. It is hardy and deserves a trial as a low trimmed hedge or as an untrimmed hedge, especially if water for irrigation is available.

Peashrubs

LITTLELEAF PEASHRUB is very hardy and drought-resistant. Although tests of this species have been very limited in the northern Great Plains, it is considered the best of the caraganas for average-height hedges in the central Great Plains. It is smaller and slower in growth than the Siberian peashrub and can be trimmed to a height of 3½ feet and a width of 3 feet. Untrimmed, it makes an attractive hedge from 5 to 7 feet tall and 5½ to 8 feet wide in 20 years.

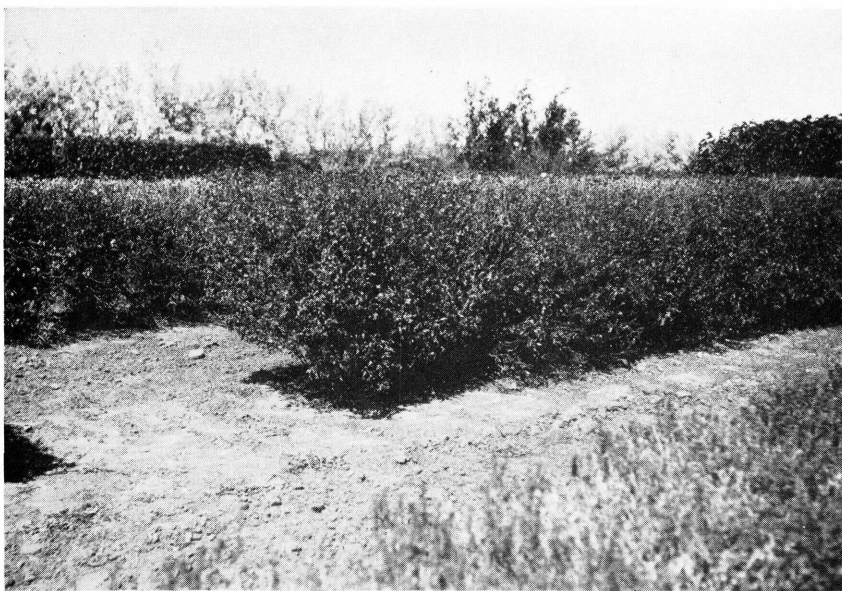
PYGMY PEASHRUB is a dwarf shrub with spiny branches and small leaves. It is hardy and drought-resistant and is one of the most desirable species for use where a low hedge is desired. It can be grown as a trimmed hedge 1 to 2 feet in height and width. As an untrimmed hedge it grows to a height and width of about 5 feet.

RUSSIAN PEASHRUB is hardy and drought-resistant. It can be used either as a trimmed or as an untrimmed hedge. Trimmed, it will be about 3 to 4 feet high and 2 to 3 feet wide. Untrimmed, it will attain a height of 4 to 5 feet and a width of 3 to 4 feet in 10 years. Its yellow flowers are larger than those of the more common Siberian peashrub, and the plants are attractive when in bloom. This is a thornless species.

SIBERIAN PEASHRUB, sometimes called **SIBERIAN PEATREE**, has marked resistance to both cold and drought. It is widely used in the northern Great Plains for both formal and informal hedges and is one of the best species for exposed locations. It does not thrive in low wet spots. As an informal hedge, it attains a height and spread of 16 to 18 feet and makes a good screen or windbreak. However, it may be trimmed and maintained at reduced dimensions if desired (fig. 18). Older plantings sometimes become a little leggy at the bottom but they make good recovery when severely cut back.

The trimmed Siberian peashrub hedge at the Mandan station was planted in 1916, has never suffered serious drought or winter injury, and is still in good condition. It had attained a height and width of about 10 feet by 1949 when it was cut back severely. It now is 6 feet high and 6 feet wide in the square section and 4½ feet high and 4 feet wide in the pyramid section.

This species is often damaged by insects. Blister beetles that sometimes defoliate the plants can be controlled by DDT or arsenical sprays or dusts. Unlike lilacs and cotoneasters, foliage of this species does not remain a good green color in the fall. It turns a yellowish green



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FIGURE 18.—Siberian peashrub hedge: Age, 19 years; height, 4½ feet; width, 4 feet.

and sometimes drops prematurely. Damage by leafhopper may hasten this turn to a yellowish color and premature dropping.

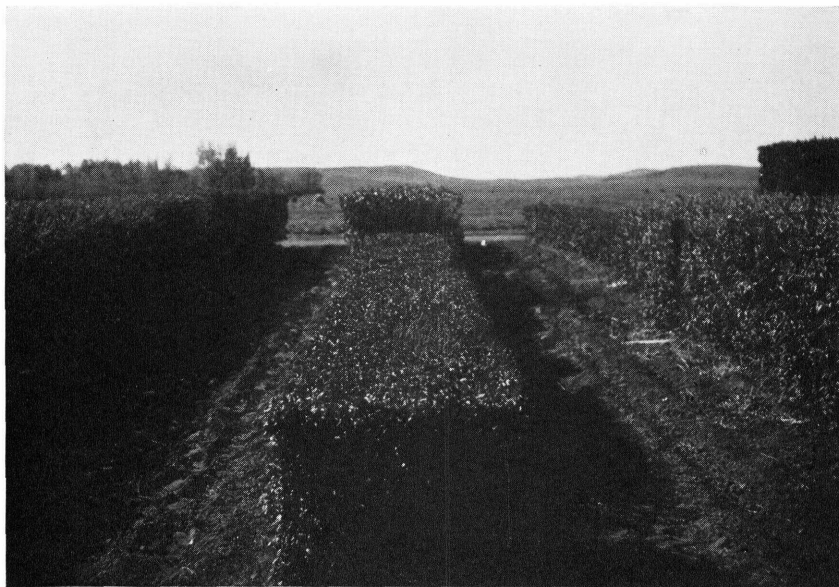
SPRING PEASHRUB is another dwarf species that is hardy and drought-resistant. As an untrimmed hedge it attains a height and spread of from 3 to 4 feet. This species makes a good barrier because of its numerous spines. It does not shear well and has a sprawly, irregular growth.

Plums

AMERICAN PLUM, a native of the northern Great Plains, is thorny, moderately hardy, and drought-resistant. It makes a fairly good trimmed hedge about 4 feet in height and width. Faults, for trimmed hedge purposes, include a tendency to become too open at the bottom, the coarse texture of its foliage, and its suckering habit. If sprouts are not removed a plum thicket will result.

Untrimmed, it can be used in windbreaks, and it is also effective as an informal hedge for background plantings. It reaches a height and spread of about 15 feet but is inclined to be a little too open at the bottom. It has an attractive bloom in the spring, and its fruit makes good jam and jelly and also furnishes food for the birds. Watering is needed in very dry years.

FLOWERING PLUM (fig. 19) shears well and makes an attractive hedge for a few years, but under dryland conditions it will have a ragged appearance as it grows older and will not be well filled out at the bottom. If watered, this species makes a good trimmed hedge of medium size. Untrimmed hedges of this species attain a height and



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FIGURE 19.—Flowering plum hedge: Age, 11 years; height, $2\frac{1}{2}$ feet; width, $2\frac{1}{2}$ feet.

spread of 8 to 12 feet. They are attractive while in bloom, especially if the double flowering form is planted. However, they are subject to considerable killing back in severe winters, at least under dryland conditions.

Prinsepia

CHERRY PRINSEPIA is hardy and drought-resistant. It shears well and can be grown as a small or medium-sized trimmed hedge 3 to 5 feet tall with a spread of from 3 to 4 feet. It does not tend to become leggy at the bottom. Its bright green foliage is narrow and neat in appearance. Its fruit is ornamental and well liked by birds. Thorns make it a good barrier. A formal hedge of cherry prinsepia planted at the Mandan station in 1949 now averages a little less than $1\frac{1}{2}$ feet tall and 1 foot wide.

Roses

RUGOSA ROSE, both the red and the white varieties, can be grown in the northern Great Plains if water is available for irrigation. However, they make poor, irregular growth under dryland conditions and the plants live only a few years. The plants are thorny, their blooms are attractive, and the ornamental fruit makes good food for birds.

Salt-Tree

SIBERIAN SALT-TREE is fairly hardy and drought-resistant. This is a thorny shrub with small, dull greyish leaves, and either pink or white flowers that resemble sweetpeas. Its sharp thorns discourage

intruders. As an untrimmed hedge, it attains a height and spread of about 6 feet. It also makes an attractive trimmed hedge about 3½ feet high and 3 feet wide. It does not seem to be injured by severe drought, but shows some killing back after severe winters. This species suckers badly and sprouts must be controlled. Suckering can be avoided by grafting it on caragana.

Serviceberries

Serviceberries should not be planted close to redcedars or junipers as they are alternate hosts of the cedar-apple rust.

RUNNING SERVICEBERRY is a dwarf species and is recommended when a low untrimmed hedge is desired. It attains a height of about 4½ feet and a spread of about 6 feet. Its suckering habit keeps it dense at the bottom, and it is hardy and drought-resistant. It has a nice blossom and its fruit is good to eat.

SASKATOON SERVICEBERRY makes a dense informal hedge about 14 feet tall and 12 feet wide. This species is hardy and drought-resistant. Its suckering habit keeps it green close to the ground. It has an attractive bloom, and its fruit is good to eat either off the tree or when made into pies or sauce. However, picking must not be delayed for the birds love this fruit and will eat it all if they have the opportunity.

SHADBLOW SERVICEBERRY can be grown as a tall, untrimmed hedge. It grows to a height of 12 feet or more. It should not be trimmed as it becomes leggy and sparsely foliated when sheared. Shadblow serviceberry, like Saskatoon serviceberry, has an attractive white blossom in the spring, and its dark red berries are good to eat off the tree and in pies and as sauce. Birds also like this fruit.

SUCCESS SERVICEBERRY is probably a hybrid of Running serviceberry and some other species. Seedlings are hardy and drought-resistant. The plants attain a height of from 6 to 8 feet and a spread of from 6 to 9 feet, and are well filled out at the bottom. They produce heavy crops of good fruit. This variety is recommended for a hardy informal hedge that produces good fruit for family use and also food for birds.

Spireas

BILLIARD SPIREA is reasonably hardy if well watered and under such conditions makes an attractive low hedge with light red flowers. However, it suffers severely from drought and from winter injury in most years. After being killed back close to the ground it does not renew itself so readily as the Garland and Vanhoutte spirea. Many plants in the hedge tests at the Mandan station died in the drought years of the middle thirties, and it never made an attractive hedge after that. It attains a height of about 4 feet and a spread of 5 feet.

GARLAND SPIREA is the earliest spirea to bloom in the spring, and its attractive white floral display lasts about 2 weeks. Its fine foliage and dense growth habit make it attractive as an untrimmed

hedge throughout the season. It is not entirely hardy under dryland conditions, sometimes killing back so badly that it is necessary to cut the whole hedge back close to the ground. However, it quickly renews itself with vigorous new growth. It grows to about 6 feet in height and has a spread of about 8 feet. It can be trimmed to make a medium-sized formal hedge but it is most useful as an informal flowering hedge.

KOREAN SPIREA appears to be desirable for use in the northern Great Plains as a late-blooming informal hedge. Its white blooms appear about 2 weeks later than Vanhoutte spirea and thus make an attractive floral display after the latter is finished. Korean spirea has been tested at the Mandan station since 1946 as an untrimmed hedge. It has not killed back very severely as yet, and recovery from winter injury has been good. It now measures about 5½ feet tall and has a spread of about 5 feet.

VANHOUTTE SPIREA (fig. 20) is one of the most attractive of the untrimmed flowering hedges. It may be trimmed to make a medium-sized formal hedge but it is most useful in the untrimmed form. It grows to a height of about 6 to 7 feet and a width of about 8 feet. Its attractive white blooms appear about a week or two later than Garland Spirea, and its fine foliage and dense growth continue to make it an attractive untrimmed hedge throughout the growing season. Like Garland Spirea, this species kills back so severely at times that it is necessary to cut the hedge back close to the ground, but it makes a vigorous recovery. It can be grown under dryland conditions, but it does even better where watering is feasible.



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FIGURE 20.—Vanhoutte spirea untrimmed hedge: Age, 19 years; height, 6½ feet; width, 7½ feet.

Spruce

BLACK HILLS SPRUCE makes an excellent tall informal hedge for windbreak or screen purposes as it retains its branches close to the ground and is of dense growth. It also can be trimmed to make an attractive tall formal hedge. It is very hardy and moderately drought-resistant. However, it sometimes suffers from attacks of red spiders.

BLUE SPRUCE, like Black Hills spruce, is hardy and drought-resistant. It makes an excellent tall screen or windbreak. If the trees are planted close together they can be trimmed to make an excellent formal hedge about 5 feet high and 3 feet wide. As the trees show considerable variation in the color of their foliage, a formal hedge of this species will be more attractive if an effort is made to select trees of uniform color for planting stock. Trees that have the bluish tinge that is often seen in this species will make an especially attractive hedge.

Viburnums

AMERICAN CRANBERRYBUSH appears to be hardy if ample water is available for irrigation and it may be suitable for an untrimmed hedge under such conditions. It grows to a height of about 10 feet and its red or yellow berries are attractive and suitable for jelly. It is too open and coarse to make a good trimmed hedge. It kills back severely after dry summers and does not survive under dryland culture.

EUROPEAN CRANBERRYBUSH may be of use as an untrimmed hedge in the northern Great Plains if water is available for irrigation. Irrigated trees at the Mandan station have lived for many years. However, when grown as a trimmed hedge without irrigation at the Mandan station, this species suffered severe killing back, especially after dry summers. It was too open at the bottom, sheared badly, and did not make an attractive hedge. It should not be grown in the northern Great Plains under dryland conditions.

SNOWBALL is similar to European Cranberrybush and can be recommended for planting in the northern Great Plains only where water for irrigation is available. Under favorable conditions, the untrimmed hedge grows to a height of 6 or 7 feet and is very attractive while in bloom.

NANNYBERRY is by far the hardiest and most drought-resistant viburnum for planting in the northern Great Plains. It is somewhat coarse in texture for a trimmed hedge. However, it retains its branches and leaves close to the ground and makes a good untrimmed hedge for shelter, screen, or background purposes. It attains an average height of about 8 feet and width of about 9 feet. It has attractive blossoms in the spring, and these are followed by ornamental fruit.

Willows

WILLOWS are not recommended for hedge plantings in the northern Great Plains, at least under dryland conditions. They should be

planted only in locations favored by a good supply of moisture or where ample irrigation water is available. If water is available, some willow species add attractiveness to the winter landscape because of their bright-colored bark. Three species recommended for winter coloring effects are: **REDSTEM WHITE WILLOW**, **PURPLEOSIER (or URAL) WILLOW**, and **YELLOWSTEM WHITE WILLOW**. For best effect, they should be cut back to the ground in early spring and then allowed to grow during the rest of the year, as most of the attractive coloring is on the long new growth.

DWARF ARCTIC WILLOW is a hardy, dwarf willow of dense growth with small narrow bluish-green leaves. It is probably the best willow for a small trimmed or untrimmed dense hedge. As with all willows, water is essential for best results. This species is sold under the name "Dwarf Blue Leaf" or "Blue Leaf Arctic."

VINES AS SUBSTITUTES FOR HEDGES

Vines are sometimes grown on fences or trellises to serve as quick-growing substitutes for hedges. Hardy vines that can be used for this purpose in the northern Great Plains include the following:

AMERICAN BITTERSWEET is a native vine generally found in canyons along rivers. It is hardy and is prized for its orange and red fruits which stay on the vines most of the winter.

NATIVE FROST GRAPE is hardy and drought-resistant and when supported by wires or fences, it makes a good substitute for a hedge. The fruit is suitable for grape juice, wine, and jelly, as well as food for birds.

WESTERN VIRGINSBOWER, a native of the northern Great Plains, is drought-resistant and very hardy. It makes a dense vine cover for fences and trellises. Its attractive white flowers are followed by plumed seed clusters, which are showy in the autumn.

VIRGINIA CREEPER (or WOODBINE) is hardy and drought-resistant. Its foliage turns to an attractive red color in the fall. Pruning is necessary to keep the vines within bounds. It is probably the best and without doubt the most popular vine for this area.

ENGELMANN VIRGINIA CREEPER, like the common woodbine, is hardy and drought-resistant. It clings to stone or brick walls in addition to fences and trellises. The leaves turn red in the fall. The vine must be pruned to keep it within bounds.